Bringing Space to Students

STARDUST is managed for NASA's Space Science Division by the Jet Propulsion Laboratory (JPL), a division of the California Institute of Technology (Caltech). STARDUST is a collaborative partnership made up of the University of Washington, Lockheed Martin Astronautics, and JPL/Caltech. The STARDUST mission is the fourth chosen for NASA's Discovery Program. These low-cost solar system projects were designed to perform focused science with fast turnaround times and cost less than $150 million (in fiscal 1992 dollars) to build, and are joint efforts with industry, small businesses, and universities.

As a Discovery mission, STARDUST provides opportunities for students to learn about exciting new scientific results and how they are achieved. We have established partnerships with the Challenger Centers for Space Science Education, the Jason Foundation, and the Omniplex Institute to provide hands-on learning experiences for students. STARDUST also can be found represented in museums and planetariums.

The principal investigator, Dr. Donald Brownlee of the University of Washington, leads a global team of scientists. Dr. Brownlee is well known for his work on cosmic particles in the stratosphere, known as Brownlee particles. Lockheed Martin Astronautics, the industrial partner, brings years of experience in space missions to the project. Lockheed Martin Astronautics is building the lightweight, low-cost STARDUST spacecraft and sample-return capsule.

Dr. Anthony Tuzzolino of the University of Chicago is providing the Dust Flux Monitor Instrument, and Professor Jochen Kissel of the Max Planck Institute in Heidelberg, Germany, is providing the Cometary and Interstellar Dust Analyzer.

Want to Know More?

Visit the STARDUST Home Page at:
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STARDUST

Bringing Cosmic History to Earth

Jet Propulsion Laboratory

Billowing clouds of ice, dust, and gases, wanderers of the solar system, voyagers from places only dreamed of by humans — these are comets. The keys that unlock the mystery of the early evolution of Earth may be found in comets. Striking Earth throughout its history, comets created changes to our atmosphere and climate, at the same time introducing carbon-based molecules, fundamental components for life on this planet. These cataclysmic changes may be responsible for the extinction of the dinosaurs. By investigating comets, we can explore the mystery of life and the wonders of the universe.

The STARDUST mission, sponsored by the National Aeronautics and Space Administration (NASA), plans to fly by comet Wild 2 (pronounced "Vilt" 2), and for the first time ever, bring pristine samples of cometary material back to Earth.

In addition, STARDUST plans to collect and return grains from a newly discovered stream of particles coming into the Solar System from interstellar space. These samples will provide a window into the distant past, helping scientists around the world to unravel other mysteries surrounding the birth and evolution of the solar system.

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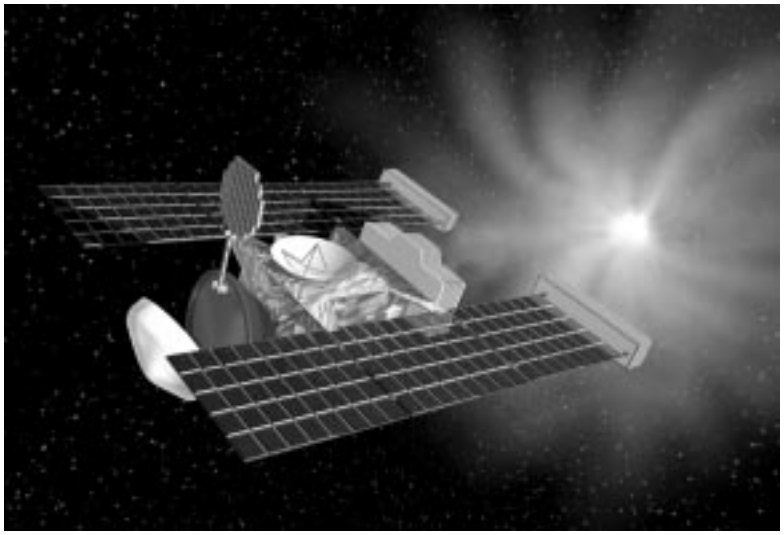
The Trip There and Back

STARDUST is scheduled to blast off from NASA's Kennedy Space Center on a Boeing Delta rocket early in 1999. The encounter with Wild 2 will take place in 2004, at a distance of about 390 million kilometers (242 million miles) from Earth. En route to the comet, the spacecraft will make two loops around the Sun and will collect interstellar dust particles. STARDUST, with its intriguing cargo, is scheduled to return to our world in the year 2006.

During its closest approach to the comet, STARDUST plans to come within 150 kilometers (93 miles) of the comet nucleus and take detailed photographs of the comet's surface features. STARDUST will also carry an impact mass spectrometer, provided by Max Planck Institute in Germany, which will analyze the composition of the cometary and interstellar dust particles. A dust flux monitor, which will "hear" the particles hitting the dust shield, will also be installed on the spacecraft.

This advanced spacecraft combines economy with the ability to carry out demanding mission activities. Its low mass (only about 400 kilograms or 880 pounds) and energy-gaining roundabout flight path all help to minimize the cost of the launch. The spacecraft also uses spare parts from other deep space projects, such as lens shutters, camera components, and electronics.



On the return journey, STARDUST's samples will be stored in a capsule that will separate from the main body of the spacecraft, reenter Earth's atmosphere, and be collected on the ground by the STARDUST science team. The capsule will be protected from the fierce heat of reentry by a new, carbon-based shield, developed by NASA Ames Research Center. The capsule will descend gently through the atmosphere by parachute, and the main body of the spacecraft will go on to travel in a long-lived orbit through space.

With electricity supplied by solar panels, the spacecraft will have been in space for seven years and traveled 5 billion kilometers (3 billion miles) to capture and return its fascinating payload.

Catching Bullets in Space

Collecting materials from a comet's coma as well as interstellar dust grains is no easy feat! When the STARDUST spacecraft flies past the comet, the impact velocity of the captured particles will be up to 6 times the speed of a bullet fired from a rifle. Although the captured particles will each be smaller than a grain of sand, high-speed capture could alter their shape and chemical composition — or vaporize them entirely. To collect the particles without damaging them, STARDUST will use an extraordinary substance called aerogel, a silica-based solid with a porous, sponge-like structure in which 99 percent of the volume is empty space. One thousand times less dense than glass, aerogel is sometimes called "mystifying blue smoke." When a particle hits the aerogel, it will create a carrot-shaped path as it slows down and comes to a stop. Scientists will use these tracks to find the tiny particles.